Claims

1. A wire bond apparatus for bonding wires to a semiconductor device having a top surface, said apparatus comprising:

a wire having a barb at one end;

a bond pad on said top surface of said semiconductor device; and

an underpad layer beneath said bond pad to receive said barb inserted through said bond pad.

2. The apparatus of claim 1 wherein said barb includes a pointed end, and flares outwards away from said wire, such that at least a portion of said barb is arrowhead shaped.

3. The apparatus of claim 2 wherein said bond pad is made of a plurality of conductive materials including an intermediate layer for preventing intermetallic compounds from forming.

4. The apparatus of claim 1 wherein said bond pad seals said barbed end when said barb is inserted through said bond pad.

5. The apparatus of claim 4 wherein said bond pad comprises a metal alloy, a ceramic, or a porous metal, such that metal can be rejoined to electrically connect said bond pad with said wire after said barb is inserted.

6. The apparatus of claim 1 including a cushioning layer or cavity within said underpad layer to dampen a piercing force from said barb.

7. The apparatus of claim 6 wherein said cushioning layer comprises a polymer, SiLK®, a ceramic composition, a porous metal structure, or a soft metal.

8. The apparatus of claim 1 wherein an outer diameter of said barb may be less than an outer diameter of said wire.

9. The apparatus of claim 1 further including a shaft between said barb and said wire, said shaft of a smaller diameter than said wire and said barb.

10. The apparatus of claim 1 including said barb having a planar arrowhead structure or an "X" cross sectional biaxial structure.

11. The apparatus of claim 10 further including having said biaxial structure comprise two flat planar arrowheads in a coaxial axis configuration that are 90^{o} phase crossed.

12. A method for bonding a wire to a semiconductor device having a top surface, said method comprising:

inserting said wire within a hollow metal tube such that a portion of one end of said wire extends through said tube, said tube capable of structurally supporting said wire during subsequent thermal processing;

heating said wire to a molten state to structurally modify said portion of one end of said wire;

forming said portion of one end of said wire in said molten state into a barb pointed end;

inserting said wire with said barb pointed end into and through a bond pad; and

removing said tube.

13. The method of claim 12 further including forming an alloy ball or bead at said portion of one end of said wire.

14. The method of claim 12 wherein said step of forming said barb pointed end includes said portion of one end of said wire in said molten state extruding from said tube into a swage to shape said portion of one end of said wire into a barb pointed end.

15. The method of claim 12 wherein said step of forming said barb pointed end includes facilitating dendrite growth on said portion of one end of said wire, applying an angled PVD deposition at said portion of one end of said wire, crimping said wire, or using a mold to form said portion of one end of said wire into a barb pointed end.

16. The method of claim 13 including adding an alloy material to said alloy ball or bead for hardness when said alloy ball or bead is cooled.

17. The method of claim 16 wherein said alloy material comprises nickel, copper alloy, tin alloy, or chromium alloy.

18. The method of claim 12 further comprising inserting said barb pointed end within an underpad layer below said bond pad.

19. The method of claim 12 including forming a thin metal pad layer under said bond pad.

20. A method for inserting a barbed-end wire bond into a dielectric, comprising:

forming a conductive plate over a dielectric base, said conductive plate having an opening larger than said wire bond without said barbed-end;

inserting said barbed-end wire bond through said opening into said dielectric.